(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 165 320 B1**

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **03.06.92**

(51) Int. Cl.[5]: **G11B 7/00**, G11B 20/00, G11B 20/10, G11B 23/36

(21) Application number: **85900170.3**

(22) Date of filing: **30.11.84**

(86) International application number:
**PCT/JP84/00570**

(87) International publication number:
**WO 85/02481 (06.06.85 85/13)**

(54) **DISK-SHAPED RECORDING MEDIUM AND APPARATUS FOR REPRODUCING THE SAME.**

(30) Priority: **30.11.83 JP 226598/83**

(43) Date of publication of application:
**27.12.85 Bulletin 85/52**

(45) Publication of the grant of the patent:
**03.06.92 Bulletin 92/23**

(84) Designated Contracting States:
**AT CH DE FR GB LI NL SE**

(56) References cited:
**EP-A- 0 084 777**
**EP-A- 0 137 855**
**JP-A- 5 864 603**
**JP-A- 5 968 806**
**JP-A- 5 977 686**
**JP-A-58 133 690**
**JP-A-58 137 138**
**JP-A-59 198 537**

**PATENT ABSTRACTS OF JAPAN, vol. 9, no. 276 (P-402)[1999], 2nd November 1985; & JP-A-60 119 671**

(73) Proprietor: **SONY CORPORATION**
**7-35 Kitashinagawa 6-Chome Shinagawa-ku**
**Tokyo 141(JP)**

(72) Inventor: **NAKAMURA, Shoichi Sony Corporation**
**7-35, Kitashinagawa 6-chome**
**Shinagawa-ku Tokyo 141(JP)**
Inventor: **SUZUKI, Tadao Sony Corporation**
**7-35, Kitashinagawa 6-chome**
**Shinagawa-ku Tokyo 141(JP)**

(74) Representative: **Ayers, Martyn Lewis Stanley et al**
**J.A. KEMP & CO. 14 South Square Gray's Inn**
**London, WC1R 5EU(GB)**



EP 0 165 320 B1

## Description

This invention relates to a disc recording medium and an apparatus for playback thereof.

The system employing an optically encoded digital audio disc (referred to hereafter as a compact disc) system, which is applied with an error correcting code of high correctability, can reproduce high-quality stereo music. If character data, still picture data and video game program are recoded together with the stereo music data on the same compact disc in the same signal format employing the same error correcting code, it becomes possible to reproduce still pictures such as paintings corresponding to the reproduced music or to display the composer's name and the title of the music piece while the user enjoys the reproduced stereo music, and also possible to reproduce suitable music for running video programs so as to expand the field or application of the present compact disc system. One prior-art compact disc has a data storage capacity of about 500 M bytes and thus can afford to store both stereo musical data and digital data.

However, since many titles of present compact discs, on which only stereo music is recorded, have been already sold it would be preferable if the audio part of a disc storing both digital stereo musical and other digital data as above-mentioned could be reproduced without any trouble by prior art disc playback systems which are at present employed to play prior art compact discs on which there is recorded stereo musical data.

On the other hand, it is desirable to introduce newly designed disc playback systems which are able to play both prior art compact discs and discs storing the two kinds of data as described above, or further able to reproduce discs storing solely non-audio digital data. As regards the discs on which only stereo music is recorded, with the structure of disc according to the invention, not only persons who own the conventional disc playback systems are able to enjoy high-quality stereo music as before, but also persons who own the new type disc playback system to which are added display devices and so on are able to enjoy both reproduction of stereo music and reproduction of still pictures according to this invention.

Since the conventional disc playback system, however, aims at reproducing stereo music, when the disc storing digital data such as still picture data other than musical data is played such a system, high level noise is generated so as to cause problems such as to damage loudspeakers and so on. Accordingly, the desired disc must prohibit prior art disc playback systems from audibly reproducing digital data other than stereo music. One method is to store the digital data in a pause section between of section of musical data and another section of musical data. However, this pause section is not necessarily mute but is sometimes treated as a fade-in and fade-out section. Since prior art disc playback systems cannot hold the pause section mute, the pause section cannot usefully store digital data.

EP-A-0137855 proposes a digital disc having audio and visual data stored thereon, the two types of data being interleaved between one another. It is possible for the pick-up head of the disc player to drift in use, and with such an arrangement, the visual data may be reproduced by the audio reproducing circuitry thus producing noise and possible damage to the disc player.

JP-A-58-64603 discloses a video disc comprising identification data tracks at an outermost circumference followed by warning data tracks, control tracks and video tracks. The warning data are only reproduced in a general purpose reproduction system. It is well known to provide CDs with a lead-in track and a lead-out track.

According to the present invention there is provided a disc storing data of a first kind in a first annular area bounded by a first lead-in track and a first lead-out track, and to be reproduced in a direction from the first lead-in track towards the first lead-out track, characterized in that a second annular area succeeds, in said direction of reproducing, the first annular area and stores data of a second kind and in that recognition data for distinguishing the disk containing both said first and second kinds of data - from a conventional type of disc containing only the first kind of data, is recorded in a touch preceding, in the direction of reproducing the first annular area.

With the invention it is possible to provide a disc recording medium which stores first digital data such as stereo musical and second digital data such as still picture data which can be used in prior art disc playback systems which are able to play only the first type of digital data. This also minimizes the waiting time to start reproducing the first type of digital data.

An apparatus according to the present invention can use both prior art digital discs storing, for example only stereo music data, and discs storing two kinds of data, for example stereo music data and still picture data. In particular it is able to prevent noise from being generated due to a prior art apparatus reproducing digital data other than audio data.

In this invention, a disc recording medium stores a first type of digital data and a second type of digital data after the end of the first type of digital data,and comprises a lead-in track which includes recognition data indicating whether the disc stores the second type of digital data.

Thus, the present invention also provides a disc playback apparatus capable of playing a disc having a first recording region for storing a first type of data signal, a second recording region succeeding the first recording region and for storing a second type of data signal a lead-in region preceding the first recording region and for storing an identifying data signal for indicating the presence of the second recording region, characterised in that it comprises:

a first reproduction processing circuit for reproducing the first type of data signal;

a second reproduction processing circuit for reproducing the second type of data signal; and

a control circuit supplied with the identifying data signal and for outputting a signal controlling operation of said pickup means and said first and second reproduction processing circuits; characterised in that

the disc has a lead-out region between the first recording region and the second recording region and for storing an end a data signal for indicating the end of the first recording region; and

said control circuit controls said pickup means so as to move, after reading the lead-in region and when the identifying data signal indicates the presence of the second recording region to the second recording region and then to return to the first recording region.

The control circuit preferably outputs a signal to change over the control of reproducing operation of the pick-up, and from the first reproduction processing circuit to the second reproduction processing circuit according to the type of data to be processed.

The following description is given merely by way of example with reference to the accompanying drawings in which:-

Figs. 1 and 2 are schematic diagrams of an arrangement of data stored in a disc.

Figs 3A to 3C are schematic diagrams of an arrangement of the Q-channel data of a subcoding signal.

Fig. 4 is a cross-sectional diagram of a prior art compact disc.

Fig. 5 is a schematic diagram of a type of data construction of digital data.

Figs. 6 to 9 are cross-sectional diagrams showing discs according to some embodiments of this invention.

Fig. 10 is a block diagram showing an apparatus for playback of disc according to an embodiment of this invention.

Figs. 11 to 13 are schematic diagrams of the playback apparatus for use with a disc of the type shown in Fig. 10 according to the present invention.

Referring to Figs. 1 and 2, a typical data construction will be described in case of audio data being stored in a compact disc.

Fig. 1 illustrates a data stream as stored in the compact disc. One frame consists of 588 bits of data to be recorded and includes a frame synchronizing pulse FS of a particular bit pattern which is followed by the first direct-current component constraint bits group RB consisting of 3 bits. Following these, the 0th to 32nd groups of data bits DB, each consisting of 14 bits, and groups of direct-current component constraint bits RB, each consisting of 3 bits, are provided alternately. The 0th data bits DB constitute a subcoding signal or user's bits which serves for controlling disc playback or for indicating related information. The 1st to 12th and 17th to 28th groups of data bits DB are allocated to audio data in a main channel, and the rest, 13th to 16th and 29th to 32nd groups of data bits DB are allocated to parity data for error correction of the main channel. Each group of data bits DB has 14 bits of data which have been converted during recording from 8 bits of data by an 8-14 modulation technique (EFM).

Fig. 2 shows a reproduced block consisting of 98 parallel successive frames in which each group of data bits DB is converted back to 8 bits and each set of direct current component constraint bits RB is excluded. In the first two frames, the subcoding signals P to W constitute synchronizing patterns having particular bit patterns. With respect to the Q-channel, the last 16 of the 98 frames constitute an error detection CRC code.

The P-channel is a flag indicating whether the frame is a pause or music, a high level indicating a pause, a low level indicating music and a 2 Hz pulse indicating a lead-out section, so that the detecting and counting the P-channel bits makes the selection of a designated musical piece possible. The Q-channel performs similar but more complicated control. Specifically, the Q-channel information can be supplied to a microprocessor built into the disc playback apparatus to allow random music selection to reproduce another music track immediately after reproducing the currently selected music track. The remaining channels R through W constitute regions for data indicating the songwriter, composer, text and explanation of the music recorded on the disc by means of a display or voice.

Concerning the Q-channel, the first 2 bits serve as part of the synchronizing signal pattern, the next 4 bits serve as control bits, the following 4 bits serve as address bits, the subsequent 72 bits serve as data bits, and the final 16 bits serve as a CRC code.

In a lead-in track, the last 96 bits of the Q-channel are defined as a data construction as shown in Fig. 3A. The control bits of 1st to 4th bits

and address bits of 5th to 8th bits are followed by 72 bits of data. The data bits include a track number code TNR of 8 bits in two 4 bit portions which vary to represent the decimal members from 0 to 9 so that the track number code TNR varies from 00 to 99. The track number TNR is 00 in the lead-in track. The 8 bits following the track number bits represent a pointer. The 4 bits following the pointer represent minutes (MIN) data, the 4 bits following the minutes data represent seconds (SEC) data and the 4 bits following the seconds data represent frames data (75 frames equivalent to one second). The 8 bits following the 49th bit are set as all 0 and subsequent every 4 bits represent minutes, seconds and frames data of the point.

In the lead-in track and musical program area is stored data of minutes, seconds and frames which vary with time from zero minutes, zero seconds and zero frames to the lead-in track or to the end of a musical program. The lead-in track stores TOC (Table Of Contents) data enumerating what is stored in the disc and consists of a pointer and minutes, seconds and frames data. That is, the values of minutes, seconds and frames of the starting point of each musical program bearing a particular track number together with the value of the pointer, constitute the data in the Q-channel of the lead-in track.

When the pointer value is AO (hexadecimal-notation), the minutes data, indicated as P-MIN, represents the track number of a first musical program in the disc, and both the data of seconds and frames are zero. If the pointer value is A1, the minute data represents the track number of the last musical program in the disc, and both the data of seconds and frames are zero. If the pointer value is A2, the minutes, seconds and frames data represent the starting point of a lead-out track.

As described above, the lead-in track stores the data in the Q-channel but does not store the stereo musical data in the main channel. Likewise, the lead-out track does not store stereo musical data. The standards for the prior art compact disc allow the presence of a maximum of 4 bits of data including the last bit of a 16-bits data.

Fig. 3b illustrates an arrangement of data in the Q-channel in the program area. The first 4 bits constitute the control bits, the next 4 bits following the control bits constitute the address bits. The following 8 bits represent the track number TNR. As previously stated, the track number TNR of the lead-in track is 00. The track numbers TNR of the musical program area can take any value from 01 to 99. The track number TNR of the lead-out track is AA. The lead-out track starts from the end point of the last musical program stored in the disc.

The 8 bits following the track number TNR represent an index X. The index X serves to separate each musical program and increases incrementally from 01 to maximum 99. In a pause section, the index always contains 00. Minutes, seconds and frames data following the index X represents the time-elapsed of the musical program or pause. All of minutes (A MIN), seconds (A SEC) and frames (A FRAME) data following the all-zero 8 bits constitutes an absolute time data representing the time-elapsed from the very beginning of the musical program area to the end of the lead-out track. The data stored in the compact disc are accessible by reference to the absolute time code.

The control bits in the Q-channel are defined as shown in Fig. 3C. In Fig. 3C, the symbol X represents a non-defined bit and may be either 0 or 1. Control bits (00X0) mean a non-preemphasized 2-channel audio data. Control bits (10XX) and (01X1) are not yet defined. Control bits (01X0) mean that the disc stores digital data such as still picture data. Control bits (XX0X) mean inhibition of reproduction of the non-audio digital data, and control bits (XX1X) mean allowance of reproduction of the non-audio digital data. In one embodiment of this invention, a disc storing both stereo musical data and other digital data has control bits (01X1).

Referring to Fig. 4, a prior art compact disc storing such stereo musical data and subcoding signals as mentioned above will be described.

In Fig. 4, the reference numeral 1 designates a prior art compact disc, and the reference numeral 2 designates a central hole therein. The compact disc 1 is applied with a reproducing laser beam from its underside, and plays back from the inner periphery towards the outer periphery thereof. The diameter of the central hole 2 is 15mm. The reference numeral 3 designates a clamping area (having a radial range of 26 mm to 33 mm) where the compact disc 1 is supported, when the compact disc 1 is inserted into the player. The reference numeral 4 designates the program area (having a radial range of 50 mm to 116 mm), the reference numeral 5 designates an information area (having a radial range of 45 mm to 118 mm). The starting point 6 (at a maximum radius of 46 mm) of the lead-in text is located radially inward of the program area 4 but within the information area 5. The final lead-out point 7 is located radially outward of the program area 4 within the information area 5.

A disc according to an embodiment of the invention has the same thickness and diameter as a conventional compact disc 1 and stores both stereo musical data and other digital data as the main channel data. The arrangement of data in the P-channel and Q-channel of the subcoding signals in the disc of this invention are the same as in the conventional compact disc.

The Fig. 5 illustrates the recording format of the digital data. Each digital data comprises 2352 bytes (=588 x 4 bytes) as a one block unit. In Fig. 5, the left channel and right channel as described indicate correspondence to the sampling data of the left and right channels of stereo musical data. In case of stereo musical data, as above described, since 24 (= 6 x 2 x 2) bytes of data is recorded within the period defined by consecutive frame synchronizing signals, if other digital data is recorded in the same format (referring to Fig. 1) as for stereo musical data, the data of one block (2352 bytes) is recorded on from the 0th to 97th frames. Accordingly, the digital data can be recorded without disrupting the 98-frame cycle of the variation of the subcoding signals.

The first byte of the digital data of one block is all zeros and the next ten bytes are all ones, followed finally by another byte of zeros. These 12 bytes constitute a header indicating the beginning of one block of digital data. The header is followed by minutes data, seconds data, sector data and mode data each of one byte. The minute, second and sector bytes specify one block address, with the 75 sectors counting one second similar to 75 frames. The mode data indicates the kinds of digital data in still picture data other than the header, address (minutes, seconds, sector) and mode.

According to some embodiments of this invention, examples of discs storing both digital stereo musical data and other digital data will now be described, referring to Figs. 6 to 9.

A disc 11 shown in Fig. 6 includes a generic information area 21 in which an information area 5 is located at a range from the inner point thereof to the predetermined outer point thereof. The digital stereo musical data is stored in a first program area 4 within the information area 5. A first lead-in track starting from a point 6 is located radially inward of the first program area 4. A lead-out track is located radially inward of the final lead-out point 7 but radially outside of the first program area 4. Subcoding signals stored in the first lead-in track and the first lead-out track and the first program area 4 of the disc of this invention are similar to those in the prior art compact disc. However, the control bits of the data in the Q-channel stored in the first lead-in track (track number TNR=00) are (01X1) which indicates that the disc stores both digital stereo musical data and other digital data.

Reading this control data by a disc playback apparatus, the playback starting point jumps to the starting point of the first lead-out track, and the track number TNR=AA of the first lead-out track is neglected so as to control the playback of the disc and to playback up to the tracks in the outer periphery of the disc.

A second program area 23 is located outside a second lead-in area 22 which is located outside of the information area 5 within the generic information area 21. A second lead-out track is located outside of the second program area 23 but inside of a second final lead-out limit 24. The second program area 23 stores digital data, for example, still picture data as shown in Fig. 5. The second lead-in area 22 and the second lead-out track store the subcoding signals of the Q-channel as shown in Fig. 3B. The track number TNR of the second lead-in area 22 is AD and the track number TNR of the second lead-out track is AE.

The second lead-in area 22 stores the necessary control information for playing the disc 11. The disc playback apparatus reproduces the first and second program areas 4 and 23 in accordance with this control information until the track number AE of the second lead-out track is detected.

Fig. 7 illustrates a disc 12 according to a second embodiment of this invention. A generic information area 21 of the disc 12 comprises a second program area 23 wider than the first program area 4 so as to mainly store the non-audio digital data. The first program area 4 stores digital audio data representing a spoken notice e.g. "This disc is not intended for music and cannot be played." - in Chinese, Japan, English, German and/or French. This notice is convenient to prevent misunderstanding that the player is damaged, when the disc storing the other digital data is played on a conventional disc player which would ignore recognition data in the Q-channel of the first lead-in track of the present invention. However, the disc playback apparatus according to this invention, which is capable of playing other digital data stored in the second program area 23 of the disc 12, can be signalled not to playback the notice by means of the control information stored in the second lead-in area 22.

Fig. 8 shows a disc 13 serving mainly to playback digital stereo musical data similar to the disc 11 of Fig. 6. The starting point 25 of the second lead-in track is located radially inward of the starting point 6 of the first lead-in track. The starting points 6 and 25 delimit the second lead-in area 22.

This second lead-in area 22 stores as data in the Q-channel the control bits (01X1) indicating that the disc 13 stores both digital music data and the other digital data. The initial, inner tracks of the second program area 23 of the disc 13 store control information instructing how to playback the first and second program areas 4 and 23.

Fig. 9 illustrates a disc 14 serving mainly to playback the other digital data similar to the disc 12 of Fig. 7. The first program area 4 of the disc 14 stores a notice spoken in several languages announcing that the disc 14 is not for reproducing

music. The first lead-in area is located radially inward of the first program area 4 and start at the starting point 6 of the first lead-in track. The second lead-in area 22 is located radially inward of the first lead-in area and start at the starting point 25 of the second lead-in track.

The discs 11, 12, 13 and 14 of this invention as above shown in Figs. 6 to 9 can be used to reproduce not only both audio data and the other digital data by means of the disc playback apparatus of this invention but also audio data alone by means of a conventional disc playback apparatus.

An embodiment of the disc playback apparatus of this invention will be described, referring to Fig. 10. In Fig. 10, the reference numeral 31 designates a disc player. Stereo music signal reproduced by the disc player 31 are outputted at output terminals 32L and 32R following demodulation of 8-14 modulated (EFM) data, error correction, interpolation and D/A conversion. The output terminals 32L, 32R of the disc player 31 are respectively supplied with left-channel and right-channel signals of the reproduced stereo signal. The audio signals in the respective left-channel and right-channel are supplied to left-side and right-side speakers 34L and 34R through amplifiers 33L and 33R, so that the user can enjoy the reproduced stero music.

If the disc being reproduced by the disc player 31 stores solely digital data other than stereo musical data, the reproduced data from this disc is supplied to a serial-parallel converter 35, which receives frame pulses and a bit clock signal both synchronized with the reproduced data from the disc player 31 and outpuuts 8-bit parallel data as symbols. The parallel data are alternately written into buffer memories 37 and 38 selected by an input switch 36. A control-data separating circuit 40 is provided, relating to the serial-parallel converter 35.

The reference numeral 41 designates a controller including a microcomputer. The controller 41 receives control data from the control-data separating circuit 40 and the subcoding signals from the disc player 31. The Q-channel of the subcoding signals includes a recognition code (control bits) indicating that the disc stores both stereo musical signals and the other digital data. The controller 41 generates a control signal to be supplied to the disc player 31 so as to control switching of the reproducing output signal path in accordance with the recognition code.

Contents of the buffer memories 37 and 38 are read out alternatingly by means of an output switch 39 and supplied to a DMA (direct memory access) controller 42 which is controlled by the controller 41.

The output from the DMA controller 42 is supplied to a data selector 43 which is controlled by the controller 41 and distributes the output data from the DMA controller 42 to different circuits in accordance with the mode of still-picture, digital data (game program etc.). In the still picture mode, output data from the data selector 43 is written into a frame memory 45 via a decoder 44 for colored-picture data consisting of Y,U and V components. The controller 41 controls the operation of the decoder 44 and the frame memory 45. The single-frame still picture data read out from the frame memory 45 is converted to analog color video signals by a D/A converter 46 and supplied to a CRT (cathod ray tube) display 47.

In the game program mode, the output data from the data selector 43 is supplied to a data converter 48 and convetered into serial data in a predetermined format, and is supplied to a microcomputer system 50 through an interface 49.

The operation of the above-mentioned disc playback apparatus will be described, for example, when the disc 11 of Fig. 6 is applied thereto. As shown in Fig. 11A, for the example,the first program area 4 of the disc 11 stores 4 musical selections M1, M2, M3 and M4 separated by pause sections respectively, and the second program area 23 of the disc 11 stores single-frame still picture data D1, D2, D3 and D4 respectively corresponding to the musical selections M1, M2, M3 and M4.

When the disc player 31 reproduces the first lead-in track from the start point 6, the TOC data in the Q-channel of the subcoding signals are reproduced and supplied to to a system controller (not shown) of the disc player 31 and the controller 41. Provided that the control bits in the Q-channel show (01X1), a pickup of the disc player 31 jumps over the program 4 is shown in Fig. 11B without reproducing it and to resume reading operation from the starting point of the first lead-out track.

After the first lead-out track is reproduced, the disc player 31 reproduces the second lead-in area 22 and then supplies the controller 41 through the serial-parallel conveter 35 and a control-data separating circuit 40 with control data DR reproduced from the second lead-in area 22. Then, the first still picture data D1 is reproduced. The address data and mode data of the first still picture data D1 are supplied to the controller 41 through the serial-parallel converter 35 and the control-data separating circuit 40 and the reproduced digital data is supplied to the decoder 44 by the data selector 43. The still picture data D1 are written into the frame memory 45 through the buffer memory 37 or 38, the DMA controller 42, the data selector 43 and the decoder 44. In the case where the TOC data of the first lead-in area is reproduced first, a muting operation is performed so as to suppreass audio output during reproduction of the second lead-in

area 22 and the second program area 23.

As shown in Fig. 11B, after completing the reproduction of the still picture data D1, the pick up returns to the starting point of the first musical selection M1 and starts to reproduce it. In this case, the still picture data D1, as shown in Fig. 12, will be repeatedly read out from the frame memory so as to display still picture on the CRT display 47. Thus, the still picture reproduced by the CRT display 47 can be watched while listening to the the first musical selection M1. As shown in Fig. 11B, upon completion of reproducing the first piece M1, the pick up is quickly returned to the outer periphery of the disc 11 and then starts reproducing the still picture data D2 of the second program area 23. The TOC data of the first lead-in area or the control data of the second lead-in area 22 indicates where the still picture data D1 to D4 are stored in the second program area 23.

The reproduced still picture data D2 is treated like the still picture data D1 and as shown schematically in Fig. 12, the music M2 is reproduced from the speakers 34L and 34R and at the same time, the still picture is reproduced by the CRT display 47. Likewise, the still picture data D3, the music selection M3, the still picture data D4 and the music selection M4 are sequentially reproduced. When the second lead-out area after the last music selection M4 is reproduced, completion of all of the program data is recognized and its reproducing operation is stopped.

The music data stored in the disc 11 can be reproduced by prior art disc playback apparatus capable of reproducing only stereo music. That is, reproduction of the first lead-in track is started from the start point 6 of the disc 11, and the TOC data is reproduced. Even if the control bits in the Q-channel in the first lead-in track is encoded as (01X1), the control bits are not decoded by the prior art disc playback apparatus as they are not recognized so the data is neglected. Therefore, the music selection M1, M2, M3 and M4 following the first lead-in track are sequentially reproduced. Completion of the first lead-out track is regarded as completion of all of the program data and its reproducing operation is stopped. Accordingly, the area outside of the first lead-out track is not reproduced so as to prevent noise from generating due to reproduction of the control data DR and still picture data D1 to D4.

The data on the discs 12, 13 and 14 of Figs. 7 to 9 can be reproduced similarly to as above described.

Furthermore, the disc playback apparatus of Fig. 10 can be employed to playback the discs storing only stereo music as well as the discs storing only the other digital data. Namely, the control bits in the Q-channel reproduced from the first lead-in area works for switching of the reproduced signal processing circuit and for muting of reproducing system of audio data.

This invention is also applicable to magnetic discs and electrostatic capacitance discs.

According to this invention, it is realized to provide discs from which stereo music is reproduced without generating large noise due to reproduction of non-audio digital data, when it is applied to a prior art disc playback apparatus for playback of the conventional disc storing music data only. Discs according to this invention make simultaneous reproduction of stereo music data and still picture possible. In addition, since digital data is recorded on the outer area of the disc, the waiting time to start reproducing stereo music data can be miminized.

According to this invention, it is possible to playback the discs storing both first digital data and second digital data as well as to prevent noise from generating due to digital data other than audio data being reproduced on a conventional player. In this invention since it is determined by recognition data whether the data stored in the disc is both of the first digital data and the second digital data or the first digital data only, prior art disc storing the first digital data only can be reproduced without trouble.

## Claims

**1.** A disc storing data of a first kind in a first annular area (4) bounded by a first lead-in track (6) and a first lead-out track (7), and to be reproduced in a direction from the first lead-in track (6) towards the first lead-out track (7), characterized in that a second annular area (23) succeeds, in said direction of reproducing, the first annular area (4) and stores data of a second kind and in that recognition data for distinguishing the disc containing both said first and second kinds of data from a conventional type of disk containing only the first kind of data, is recorded in a track preceding, in the direction of reproducing, the first annular area.

**2.** A disc according to claim 1 wherein the first lead-in track contains said recognition data and a second lead-in track (22) for said second annular area (23) succeeds the first lead-out track (7) and contains control data for controlling the operational mode for reproducing the disk.

**3.** A disc according to claim 1 wherein a second lead-in track (22), for said second annular area (23), precedes the first lead-in track (6) and contains said recognition data and the second annular area (23) contains control data for con-

trolling the operational mode for reproducing the disk.

**4.** A disc according to claim 1, 2 or 3, characterized in that said first kind of data (4) includes digital audio data.

**5.** A disc according to any one of the preceding claims, characterized in that said second kind of data (23) includes digital video data.

**6.** A disc according to any one of claims 1 to 4, characterized in that said second kind of data (23) includes computer program data.

**7.** A disc playback apparatus capable of playing a disc having a first recording region (4) for storing a first type of data signal, a second recording region (23) succeeding the first recording region (4) and for storing a second type of data signal, a lead-in region (6) preceding the first recording region (4) and for storing an identifying data signal for indicating the presence of the second recording region (23), characterised in that it comprises:

pick-up means for obtaining a reproduction signal from the disc;

a first reproduction processing circuit for reproducing the first type of data signal;

a second reproduction processing circuit (35-40, 42-46, 48-49) for reproducing the second type of data signal; and

a control circuit (41) supplied with the identifying data signal and for outputting a signal controlling the operation of said pickup means and said first and second reproduction processing circuits (31; 35-40, 42-46, 48-49); characterised in that

the disc has a lead-out region (7) between the first recording region (4) and the second recording region (23) and for storing an end data signal for indicating the end of the first recording region (4); and

said control circuit (41) controls said pickup means so as to move, after reading the lead-in region (6) and when the identifying data signal indicates the presence of the second recording region (23) to the second recording region (23) and then to return to the first recording region (4).

**8.** A disc playback apparatus according to claim 7, wherein said control circuit (41) is adapted to control said pickup means so as to reproduce the first recording region (23) when the identifying data signal indicates the absence of the second recording region (23) after reading the lead-in region (6).

**9.** A disc playback apparatus according to claim 7 or 8 wherein the identifying data signals are encoded in a sub-channel and inhibit output to one of said first and second reproduction processing circuits (31; 35-40, 42-46, 48-49).

**10.** A disc playback apparatus according to claim 7, 8 or 9 wherein the second type of data signal includes a control signal for controlling operation of said pickup means and said control circuit (41) is supplied with the control signal.

**11.** A disc playback apparatus according to claim 7, 8, 9 or 10 wherein the first type of data signal includes digital audio data and said first reproduction processing circuit (31) includes a reproducing circuit for reproducing an audio signal.

**12.** A disc playback apparatus according to claim 7, 8, 9, 10 or 11 wherein the second type of data signal includes video data and said second reproduction processing circuit (31; 35-40, 42-46, 48-49) includes a reproducing circuit (47) for reproducing a video signal.

**13.** A disc playback apparatus according to claim 7, 8, 9, 10 or 11 wherein the second type of data signal includes computer program data and said second reproduction processing circuit (31; 35-40, 42-46, 48-49) includes a computer system (50).

## Revendications

**1.** Disque stockant des données d'un premier type dans une première zone annulaire (4) délimitée par une première piste d'entrée (6) et par une première piste de sortie (7), ce disque étant destiné à être reproduit suivant une direction allant de la première piste d'entrée (6) vers la première piste de sortie (7), caractérise en ce qu'une seconde zone annulaire (23) succède à la première zone annulaire (4) suivant ladite direction de reproduction et stocke des données d'un second type et en ce que des données de reconnaissance pour distinguer le disque qui contient à la fois lesdits premier et second types de données d'un type de disque classique qui contient seulement le premier type de données sont enregistrées dans une trace qui précède la première zone annulaire suivant la direction de reproduction.

**2.** Disque selon la revendication 1, dans lequel la première piste d'entrée contient lesdites données de reconnaissance et une seconde piste

d'entrée (22) pour ladite seconde zone annulaire (23) fait suite à la première piste de sortie (7) et contient des données de commande pour commander le mode opérationnel pour la reproduction du disque.

**3.** Disque selon la revendication 1, dans lequel une seconde piste d'entrée (22), pour ladite seconde zone annulaire (23), précède la première piste d'entrée (6), et contient lesdites données de reconnaissance et la seconde zone annulaire (23) contient des données de commande pour commander le mode opérationnel pour la reproduction du disque.

**4.** Disque selon la revendication 1, 2 ou 3, caractérisé en ce que ledit premier type de données (4) inclut des données audio numériques.

**5.** Disque selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit second type de données (23) inclut des données vidéo numériques.

**6.** Disque selon l'une quelconque des revendications 1 à 4, caractérisé en ce que ledit second type de données (23) inclut des données de programme de calculateur.

**7.** Appareil de reproduction de disque permettant de reproduire un disque qui comporte une première région d'enregistrement (4) pour stocker un premier type de signal de données, une seconde région d'enregistrement (23) qui fait suite à la première région d'enregistrement (4) et qui est destinée à stocker un second type de signal de données, une région d'entrée (6) qui précède la première région d'enregistrement (4) et qui est destinée à stocker un signal de données d'identification pour indiquer la présence d'une seconde région d'enregistrement (23), caractérisé en ce qu'il comprend :

un moyen de lecteur pour obtenir un signal de reproduction à partir du disque ;

un premier circuit de traitement de reproduction pour reproduire les premiers types de signal de données ;

un second circuit de traitement de reproduction (35-40, 42-46, 48-49) pour reproduire le second type de signal de données ; et

un circuit de commande (41) qui se voit appliquer le signal de données d'identification et qui est prévu pour émettre en sortie un signal qui commande le fonctionnement dudit moyen de lecture et desdits premier et second circuits de traitement de reproduction (31 ; 35-40, 42-46, 48-49) ; caractérisé en ce que

le disque comporte une région de sortie (7) entre la première région d'enregistrement (4) et la seconde région d'enregistrement (23), cette région étant prévue pour stocker une fin d'un signal de données pour indiquer la fin de la première région d'enregistrement (4) ; et

ledit circuit de commande (41) commande ledit moyen de lecture de manière à le déplacer, après lecture de la région d'entrée (6) et lorsque le signal de données d'identification indique la présence de la seconde région d'enregistrement (23), jusqu'à la seconde région d'enregistrement (23) puis à le ramener sur la première région d'enregistrement (4).

**8.** Appareil de reproduction de disque selon la revendication 7, dans lequel ledit circuit de commande (41) est adapté pour commander ledit moyen de lecture de manière à reproduire la permière région d'enregistrement (23) lorsque le signal de données d'identification indique l'absence de la seconde région d'enregistrement (23) après lecture de la région d'entrée (6).

**9.** Appareil de reproduction de disque selon la revendication 7 ou 8, dans lequel les signaux de données d'identification sont codés dans un sous-canal et empêchent toute sortie sur l'un desdits premier et second circuits de traitement de reproduction (31 ; 35-40, 42-46, 48-49).

**10.** Appareil de reproduction de disque selon la revendication 7, 8 ou 9, dans lequel le second type de signal de données inclut un signal de commande pour commander le fonctionnement dudit moyen de lecture et ledit circuit de commande (41) se voit appliquer le signal de commande.

**11.** Appareil de reproduction de disque selon la revendication 7, 8, 9 ou 10, dans lequel le premier type de signal de données inclut des données audio numériques et ledit premier circuit de traitement de reproduction (31) inclut un circuit de reproduction pour reproduire un signal audio.

**12.** Appareil de reproduction de disque selon la revendication 7, 8, 9, 10 ou 11, dans lequel le second type de signal de données inclut des données vidéo et ledit second circuit de traitement de reproduction (31 ; 35-40, 42-46, 48-49) inclut un circuit de reproduction (47) pour reproduire un signal vidéo.

**13.** Appareil de reproduction de disque selon la revendication 7, 8, 9, 10 ou 11, dans lequel le

second type de signal de données inclut des données de programme de calculateur et ledit second circuit de traitement de reproduction (31 ; 35-40, 42-46, 48-49) inclut un système de calculateur (50).

**Patentansprüche**

1. Platte zur Speicherung von Daten einer ersten Art in einem ersten ringförmigen Bereich (4), begrenzt durch eine erste Einlaufspur (6) und einer ersten Auslaufspur (7), die in einer Richtung von der ersten Einlaufspur (6) auf die erste Auslaufspur (7) wiederzugeben sind,
**dadurch gekennzeichnet,** daß ein zweiter ringförmiger Bereich (23) dem ersten ringförmigen Bereich (4) in der genannten Wiedergaberichtung folgt und Daten einer zweiten Art speichert
und in welchem Erkennungsdaten zur Unterscheidung der Platte, die sowohl erste und zweite Arten von Daten enthält, von einem konventionellen Plattentyp, der nur die erste Art von Daten enthält, in einer vorhergehenden Spur in der Richtung zur Wiedergabe des ersten ringförmigen Bereichs gespeichert werden.

2. Platte nach Anspruch 1, wobei die erste Einlaufspur Erkennungsdaten enthält und eine zweite Einlaufspur (22) für den genannten zweiten ringförmigen Bereich (23) der ersten Auslaufspur (7) folgt und Steuerdaten zur Steuerung des Betriebsmodus für die Wiedergabe der Platte enthält.

3. Platte nach Anspruch 1, wobei eine zweite Einlaufspur (22) für den genannten zweiten ringförmigen Bereich (23) einer ersten Einlaufspur (6) vorhergeht und die genannten Erkennungsdaten enthält und wobei der zweite ringförmige Bereich Steuerdaten zum Steuern des Betriebsmodus für die Wiedergabe der Platte enthält.

4. Platte nach Anspruch 1, 2 oder 3,
**dadurch gekennzeichnet,** daß die erste Art von Daten (4) digitale Audiodaten umfaßt.

5. Platte nach einem der vorhergehenden Ansprüche,
**dadurch gekennzeichnet,** daß die genannte zweite Art von Daten (23) digitale Videodaten umfaßt.

6. Platte nach einem der Ansprüche 1 bis 4,
dadurch **gekennzeichnet,** daß die genannte zweite Art von Daten (23) Computerprogrammdaten umfaßt.

7. Plattenwiedergabegerät zum Abspielen einer Platte, die einen ersten Aufzeichnungsbereich (4) zum Speichern eines ersten Typs von Datensignalen besitzt, einen Zweiten Aufzeichnungsbereich (23), der dem ersten Aufzeichnungsbereich (4) folgt, zum Speichern eines zweiten Typs von Datensignalen, einen Einlaufbereich (6), der dem ersten Aufzeichnungsbereich vorhergeht zum Speichern eines Identifikationssignals des Vorhandenseins eines zweiten Aufzeichnungsbereichs (23),
**gekennzeichnet dadurch,** daß es enthält:
Einrichtungen zur Abnahme zur Erhaltung eines Wiedergabesignals von der Platte,
eine erste Wiedergabe-Verarbeitungsschaltung zur Wiedergabe des ersten Typs eines Datensignals,
eine zweite Wiedergabe-Verarbeitungsschaltung (35-40, 42-46, 45-49) zur Wiedergabe des zweiten Typs von Datensignalen und eine Steuerschaltung (41), versorgt mit dem Identifikationssignal und zur Ausgabe eines Signals, das den Betrieb der genannten Einrichtungen zur Abnahme steuert und erste und zweite Wiedergabe-Verarbeitungsschaltung (31, 35-40, 42-46, 48-49),
dadurch **gekennzeichnet,** daß die Platte einen Auslaufbereich (7) zwischen dem ersten Aufzeichnungsbereich (4) und dem zweiten Aufzeichnungsbereich (23) zum Speichern eines Enddatensignals zur Anzeige des Endes des ersten Aufzeichnungsbereichs (4) aufweist und die genannte Steuerschaltung (41) die Einrichtungen zur Abnahme steuert, um sich, nachdem der Einlaufbereich (6) gelesen ist und wenn die Identifikations-Datensignale die Anwesenheit eines zweiten Aufzeichnungsbereichs (23) anzeigen, zum zweiten Aufzeichnungsbereich (23) zu bewegen, um anschließend zum ersten Aufzeichnungsbereich (4) zurückzukehren.

8. Plattenwiedergabegerät nach Anspruch 7,
dadurch **gekennzeichnet,** daß die genannte Steuerschaltung (41) geeignet ist, die Einrichtungen zur Abnahme zu steuern, um den ersten Aufzeichnungsbereich (23) wiederzugeben, wenn das Identifikationsdatensignal die Abwesenheit des zweiten Aufzeichnungsbereichs (23) nach dem Lesen des Einlaufbereichs (6) anzeigt.

9. Plattenwiedergabegerät nach Anspruch 7 oder 8,
dadurch **gekennzeichnet,** daß die Identifikationssignale in einem Subkanal verschlüsselt

sind und den Ausgang zu einer von erster und zweiter Wiedergabe-Verarbeitungsschaltung (31, 35-40, 42-46, 48-49) unterdrücken.

**10.** Plattenwiedergabegerät nach Anspruch 7, 8 oder 9, wobei der zweite Typ von Datensignalen ein Steuersignal zur Steuerung des Betriebs der genannten Einrichtung zur Abnahme aufweist und daß die Steuerschaltung (41) mit dem Steuersignal versorgt wird.

**11.** Plattenwiedergabegerät nach Anspruch 7, 8, 9 oder 10, wobei der erste Typ von Datensignalen digitale Audiodaten und die erste Wiedergabe-Verarbeitungsschaltung (31) eine Wiedergabeschaltung Zur Wiedergabe eines Audiosignals enthält.

**12.** Plattenwiedergabegerät nach Anspruch 7, 8, 9, 10 oder 11, wobei der zweite Typ von Datensignalen Videodaten enthält und die zweite Wiedergabe-Verarbeitungsschaltung (31, 35-40, 42-46, 48-49) eine Wiedergabeschaltung (47) zur Wiedergabe eines Videosignals enthält.

**13.** Plattenwiedergabegerät nach Anspruch 7, 8, 9, 10 oder 11, wobei der zweite Typ von Datensignalen Computerprogrammdaten aufweist und die zweite Wiedergabe-Verarbeitungsschaltung (31, 35, 42-46, 48-49) ein Computersystem (50) enthält.

Fig. 1

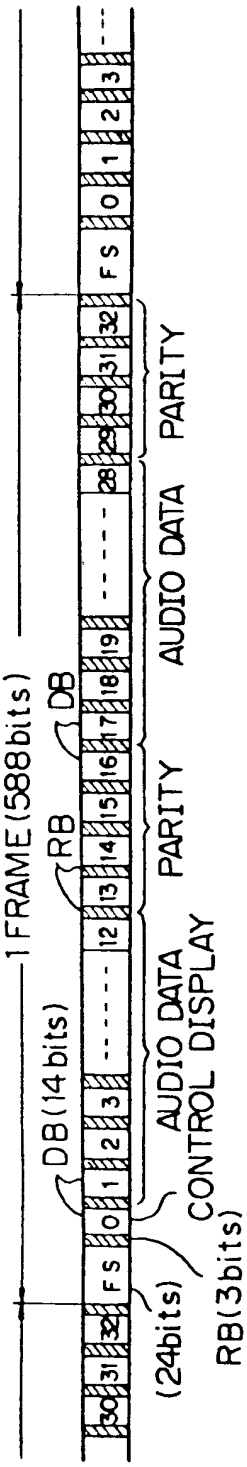
1 FRAME (588 bits)
DB (14 bits)
RB
DB
(24bits)
AUDIO DATA
CONTROL DISPLAY
PARITY
AUDIO DATA
PARITY
RB (3bits)

Fig. 2


1 BLOCK
DB (0)
DB (1~32)
0th FRAME
1st FRAME
2nd FRAME
3rd FRAME
97th FRAME
FS
SYNC PATTERN
P Q R S T U V W
DATA (6SAMPLES x 2CHANNELS)
CHANNEL
24bits
8 bits
16 x 6 x 2 bits

Fig. 3A

| | 1 2 3 4 | 5 6 7 8 | 9 10 11 12 13 14 15 16 |
|---|---|---|---|
| 1 | CONTROL | ADDRESS | TRACK NUMBER TNR (00) |
| 17 | POINTER | | MIN. |
| 33 | SEC. | | FRAME |
| 49 | 0 0 0 0 0 0 0 0 | | P MIN. |
| 65 | P SEC. | | P FRAME |
| 81 | CRC CODE | | |

Fig. 3B

| | 1 2 3 4 | 5 6 7 8 | 9 10 11 12 13 14 15 16 |
|---|---|---|---|
| 1 | CONTROL | ADDRESS | TRACK NUMBER TNR |
| 17 | X | | MIN. |
| 33 | SEC. | | FRAME |
| 49 | 0 0 0 0 0 0 0 0 | | A MIN. |
| 65 | A SEC. | | A FRAME |
| 81 | CRC CODE | | |

Fig. 3C

| BIT | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | 0 | 0 | X | 0 |
| | 0 | 0 | X | 1 |
| | 1 | 0 | X | X |
| | 0 | 1 | X | 0 |
| | 0 | 1 | X | 1 |
| | X | X | 0 | X |
| | X | X | 1 | X |

Fig. 4

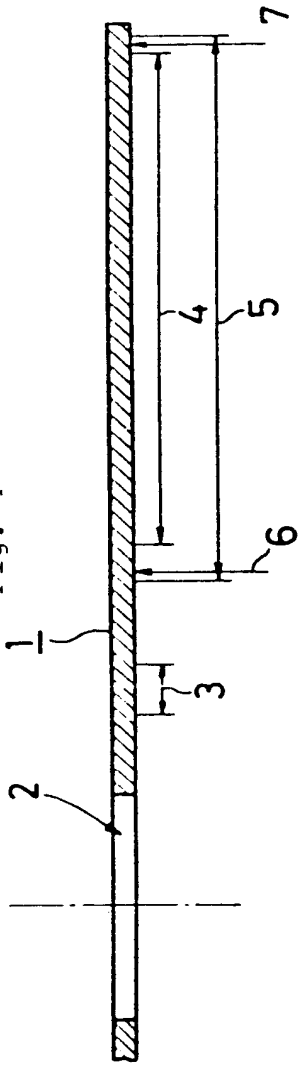
1
2
3
4
5
6
7

Fig. 5

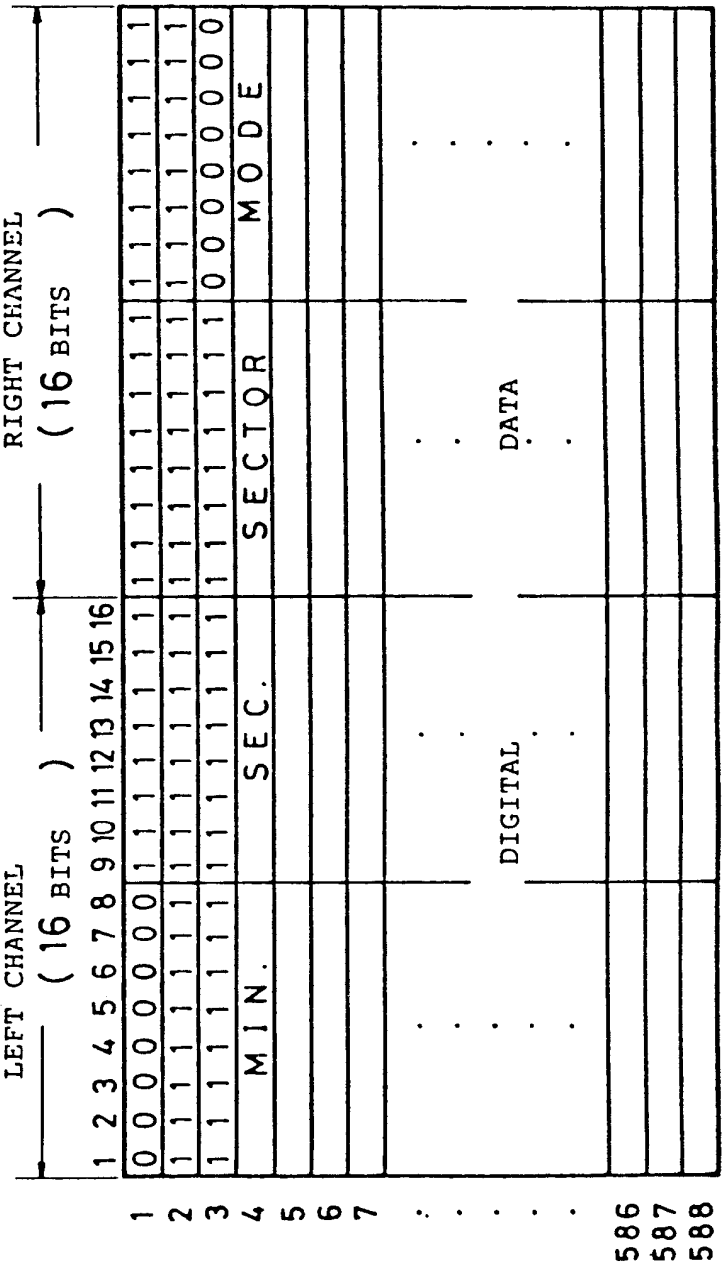
LEFT CHANNEL
( 16 BITS )
RIGHT CHANNEL
( 16 BITS )
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
MIN.
SEC.
SECTOR
MODE
DIGITAL
DATA
1
2
3
4
5
6
7
586
587
588

Fig. 6

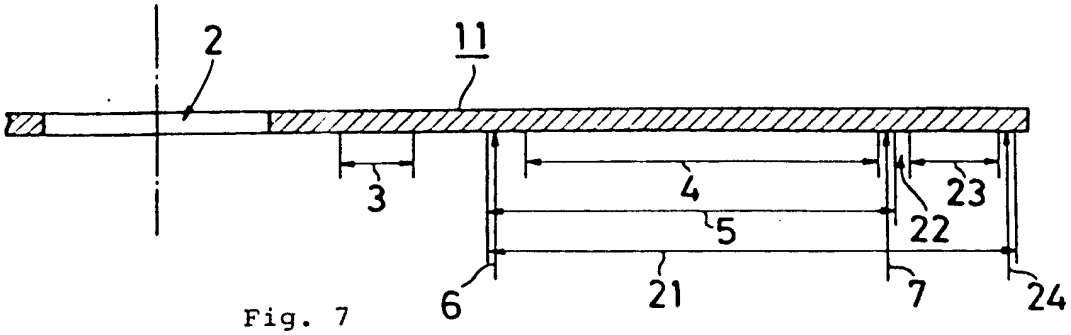


Fig. 7

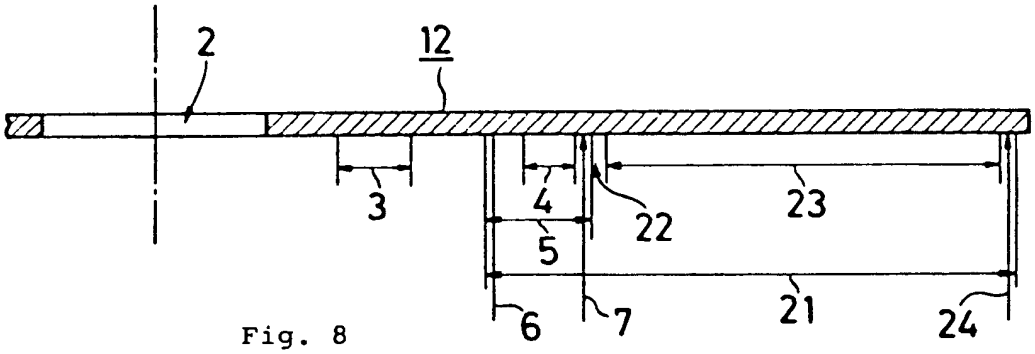


Fig. 8

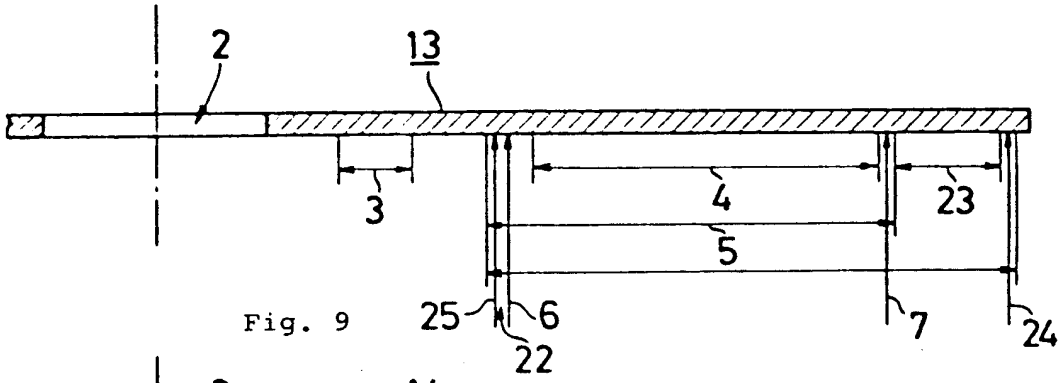


Fig. 9

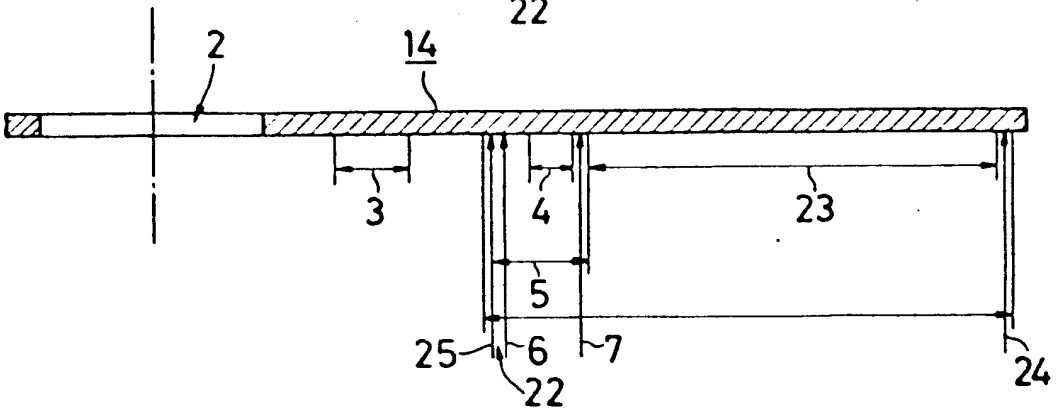

Fig. 10

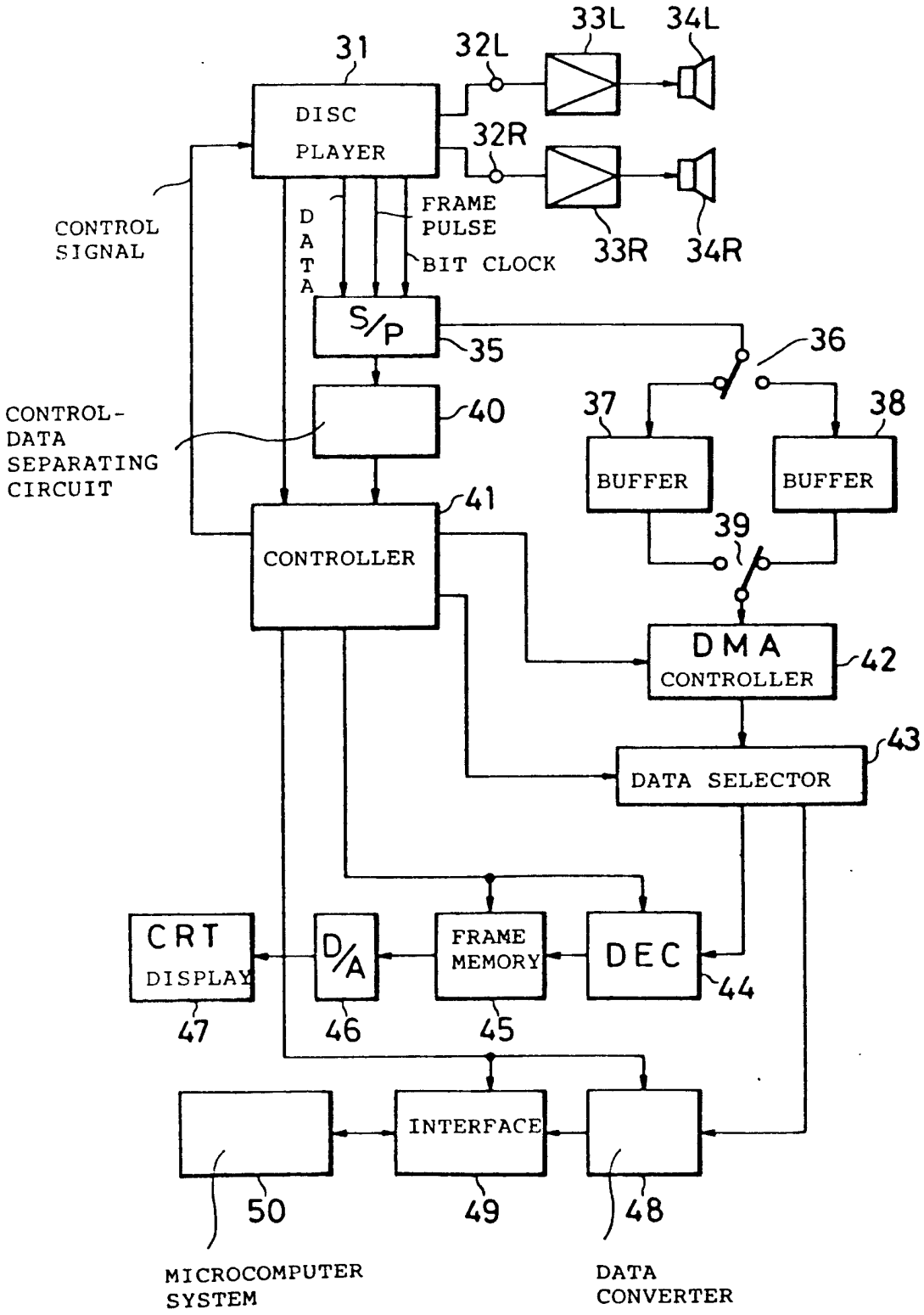
31
32L
33L
34L
DISC
PLAYER
32R
33R
34R
CONTROL
SIGNAL
DATA
FRAME
PULSE
BIT CLOCK
S/P
35
36
37
38
BUFFER
BUFFER
CONTROL-
DATA
SEPARATING
CIRCUIT
40
41
CONTROLLER
39
DMA
CONTROLLER
42
43
DATA SELECTOR
CRT
DISPLAY
D/A
FRAME
MEMORY
DEC
44
47
46
45
INTERFACE
50
49
48
MICROCOMPUTER
SYSTEM
DATA
CONVERTER

Fig. 11A

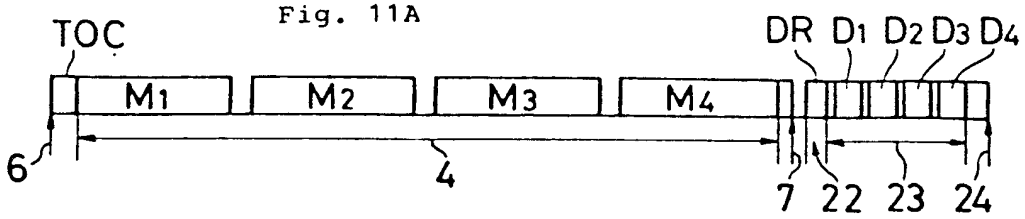


Fig. 11B

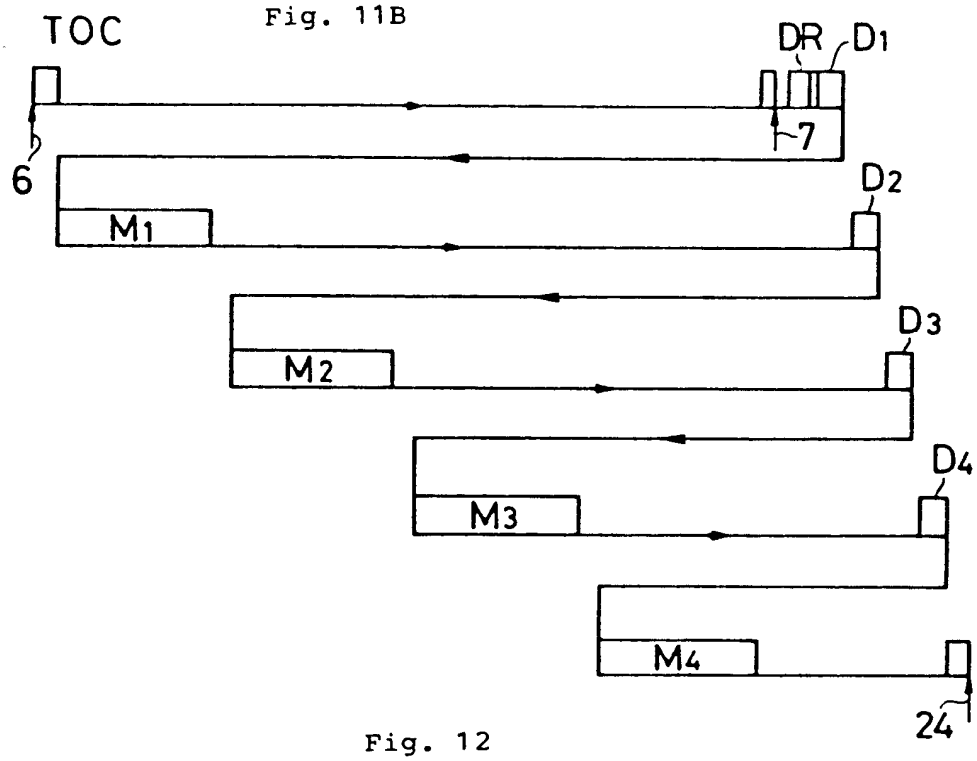


Fig. 12

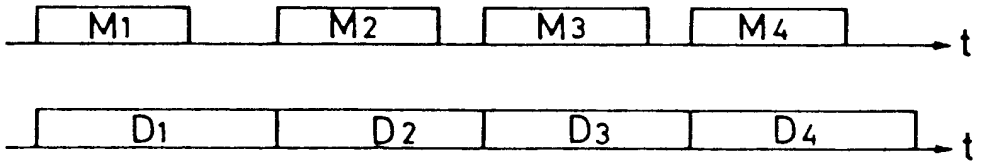


Fig. 13